U. S. FOREST SERVICE

RESEARCH NOTE NC-110

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

Folwell Avenue, St. Paul, Minnesota 55101

RISK-RATING SARATOGA SPITTLEBUG DAMAGE BY ABUNDANCE OF ALTERNATE-HOST PLANTS

ABSTRACT. — The potential damage of the Saratoga spittlebug to red pine can be predicted by comparing the percentage of ground occupied by sweet-fern with the percentage of ground cover occupied by other nymphal host plants. A risk-rating graph is used to estimate potential damage.

OXFORD: 450:145.7x14.29 *Aphrophora saratogensis*:**174.7** *Pinus resinosa.*

The Saratoga spittlebug, *Aphrophora saratogensis* (Fitch), is one of the most destructive pests of red pine (*Pinus resinosa* Ait.) plantations in the Lake States. The spittlebug adult feeds on pine shoots and causes necrotic, resin-filled wounds, which become reddish scars in the bark and wood tissue. Extensive wounding kills branches (flagging), stunts growth, and kills trees. Trees between 3 and 15 feet tall are most susceptible to attack.

The spittlebug nymphs feed in a spittlemass (fig. 1) in May and June on low-growing herbs and woody plants near the pine. The proportions of certain herbs and woody plants (alternate hosts) can be used to risk-rate the potential spittlebug injury to susceptible red pine plantations. Also, lands proposed for planting red pine can be risk-rated the same way. The nymphs require alternate host plants as well as pine to survive, and generally, if certain plant species are abundant when pine is susceptible to attack, spittlebugs are also abundant and potentially destructive.

SPITTLEBUG ALTERNATE HOSTS

Several herbs, shrubs, ferns, and hardwood seedlings furnish food for the nymphs. Sweet-fern (fig. 2), a low-growing, fern-like woody plant, is the most important alternate host. Even moderately abundant sweet-fern favors a high spittlebug population buildup, which in turn results in heavy damage to nearby pines. Second in importance is a large group of plants including blackberry, raspberry, orange hawkweed, strawberry, and others (table 1). If these plants are abundant or very abundant when sweet-fern is absent or scarce, they too may promote high population buildup of spittlebugs. Grasses, sedges, mosses, and lichens (table 1) are non-hosts.

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Figure 1. — *Spittlemass of spittlebug nymph at base of one of its host plants.*

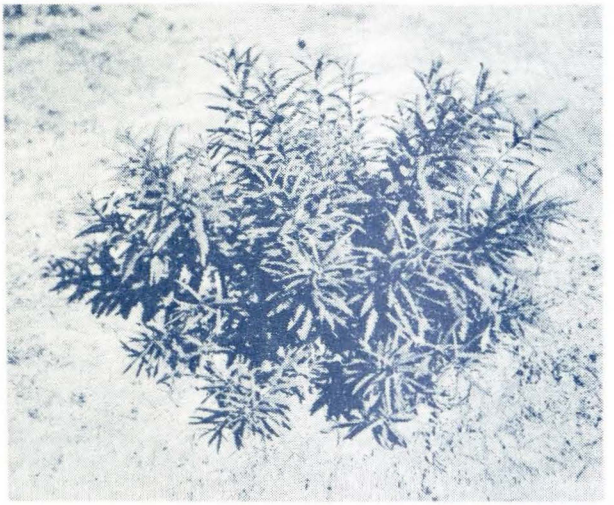

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Figure 2. — *Sweet-fern, the principal host of the spittlebug nymph.*

Table 1. — *Spittlebug nymphal hosts and non-hosts commonly found in Lake States red pine plantations*

Vegetational group	Common name	Scientific name
Primary host	Sweet-fern	Comptonia peregrina Coult.
Secondary hosts[1/]	Blackberry, raspberry	Rubus spp.
	Orange hawkweed	Hieracium aurantiacum L.
	Strawberry	Fragaria virginiana Dus.
	Bracken fern	Pteridium aquilinum (L.) Kuhn
	Blueberry	Vaccinium spp.
	Sand cherry	Prunus pumila L.
	Goldenrod	Solidago spp.
	Sheep sorrel	Rumex acetosella L.
	Cinquefoil	Potentilla spp.
	Wintergreen	Gaultheria procumbens L.
	Sumac	Rhus spp.
Non-hosts	Grasses	Gramineae
	Sedges	Carex spp.
	Mosses	Lycopodium spp.
	Lichens	Cladonia spp.

[1/] This group contains perhaps 200 species of plants that include herbs, ferns, woody shrubs, and young broadleaf trees.

RISK-RATING

Field records from hundreds of red pine plantations in Michigan and Wisconsin provided the data for the risk-rating method presented here. The only assumptions about the area to be risk-rated are that red pine stocking will be adequate for the spittlebugs (about 200 or more trees per acre), the site is adequate for good development of red pine (site index 50 or higher), and the spittlebug is present in the stand or the general vicinity. Well-stocked stands of red pine over 10 feet tall and not yet showing visible spittlebug injury symptoms are safe and need not be risk-rated.

A risk-rating graph (fig. 3) that relates the percentage of ground occupied by all other hosts is used to predict three classes of injury. *Light* injury indicates the red pines have no visible external symptoms, even though feeding scars are present on the branches (beneath the bark). *Moderate* injury indicates the pines have some growth reduction, some crooked stems, and an occasional dead or dying shoot (flagging). *Heavy* injury indicates most of the pines are stunted with crooked stems and many are either flagged, top-killed, or dead.

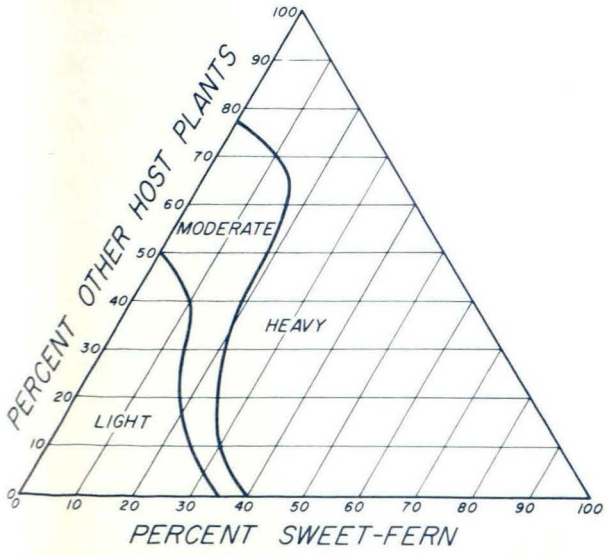

Figure 3. — *Spittlebug risk-rating triangle. To determine potential injury level, plot the percentage of ground occupied by sweet-fern against the percentage of ground occupied by other suitable hosts.*

The following procedure is suggested for risk-rating a young red pine plantation or area where red pine is considered for planting:

(1) Delimit the size of the area to be risk-rated by the degree of clustering of the alternate hosts. The more patchy the vegetation, the smaller should be the area risk-rated. For example, in very patchy stands one might risk-rate each half acre; when more uniform, several acres would be rated together.

(2) Estimate the percentage of the ground occupied by sweet-fern.

(3) Estimate the percentage of the ground occupied by other hosts (all other broadleaf herbs, ferns, etc., except non-host plants (table 1) and bare soil).

(4) Plot the percentage of sweet-fern against the percentage of other hosts on the graph (fig. 3). The point where the coordinates intercept on the graph indicates the potential injury class for the area rated.

For example, if you plot 10 percent sweet-fern against 20 percent other hosts, the potential injury given by the graph is light. If, however, you plot 30 percent sweet-fern against 30 percent other hosts, the potential injury is heavy.

RECOMMENDATIONS

After a plantation or an unplanted area is risk-rated, the land manager can evaluate the economics of protection for that plantation or decide whether or not to plant the area. The spittlebug requires several years to develop to outbreak levels and cause significant damage; then, the hazard is present for at the most 10 years. Therefore, the land manager has several alternative methods to prevent losses when the risk is moderate or heavy:

(1) Reduce the alternate host ground cover, especially sweet-fern, as early as possible before spittlebug population buildup. Consider chemical or cultural removal of the alternate hosts before the trees are 3 feet tall.

(2) Keep red pine stands well-stocked and vigorous. Fast-growing, densely stocked trees (6 x 6 feet) provide a large feeding surface area that tends to dilute the feeding scars, and at the same time promote early crown closure, which shades out the alternate-host plants.

(3) Consider chemical insecticides that reduce spittlebug injury for 3 to 5 years or more. Thus one, two, or at most three chemical applications will protect a plantation in high-hazard areas where other methods of spittlebug reduction are not practical.

LOUIS F. WILSON
Principal Insect Ecologist
East Lansing, Michigan
(Office maintained in cooperation with Michigan State University)

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